

Marked-up version of claims as amended.

1. In a method for computing and regulating the distribution of linear load in a multi-nip calender in which a material web is passed through the nips, the nips being defined by a set of rolls arranged in a substantially vertical position and including a variable-crown upper roll, a variable-crown lower roll and at least two intermediate rolls arranged between the upper roll and the lower roll, said at least two intermediate rolls being provided with support cylinders, all of the rolls in the set of rolls being supported such that, when in nip-defining relationship, the rolls have bending lines which are curved downward, the improvement comprising the steps of:

[determining] assigning a value to at least one physical property affecting the bending of each of said at least two intermediate rolls, and

regulating at least one of a ratio of the linear loads applied to said at least two intermediate rolls, the weight of said at least two intermediate rolls, and support forces applied to said at least two intermediate rolls such that the set of rolls is in a state of equilibrium and a predetermined state of deflection.

2. The method of claim 1, wherein step of [determining the] assigning a value to at least one physical property affecting the bending of each of said at least two intermediate rolls comprises the step of [determining] assigning a value to the bending rigidity, mass, shape, and material of each of said at least two intermediate rolls.

11. In an arrangement for computing and regulating the distribution of linear load in a multi-nip calender in which a material web is passed through the nips, the nips being defined by a set of rolls arranged in a substantially vertical position and including a variable-crown upper roll, a variable-crown lower roll and at least two intermediate rolls arranged between the upper roll and the lower roll, said at least two intermediate rolls being provided with support cylinders, all of the rolls in the set of rolls being supported such that, when in nip-defining relationship, the rolls have bending lines which are curved downward, the improvement comprising:

an automation system and a computing unit for [determining] assigning at least one value to a physical property affecting the bending of each of said at least two intermediate rolls and for regulating at least one of a ratio of ~~(the linear loads)~~ applied to said at least two intermediate rolls, ~~(the weight of said at least two intermediate rolls)~~, and support forces applied to said at least two intermediate rolls such that the set of rolls is in a state of equilibrium and a predetermined state of deflection.

15. The arrangement of claim 11, wherein the at least one physical property affecting the bending of each of said at least two intermediate rolls is selected from the group consisting of the bending rigidity, mass, shape, and material of each of said at least two intermediate rolls.

REMARKS

Reconsideration of the present application, as amended, is respectfully requested.

STATUS OF THE CLAIMS

Claims 1-6, 8-13 and 15-16 are pending, claims 7, 14 and 17 having been canceled been canceled, and claims 1, 2, 11 and 15 having been amended herein.

REJECTION UNDER 35 U.S.C. §101

Claim 17 was rejected under 35 U.S.C. §101. Claim 17 has been canceled herein and therefore the Examiner's rejection has been rendered moot.

REJECTION UNDER 35 U.S.C. §112, SECOND PARAGRAPH

Claims 1-17 were rejected under 35 U.S.C. §112, second paragraph, as being indefinite. Claims 1, 2, 11 and 15 have been amended herein to more clearly recite the invention. In addition claim 17 has been cancelled. In view of the amendments to the claims it is submitted that the Examiner's rejections under 35 U.S.C. §112, second paragraph have been overcome.

REJECTIONS UNDER 35 U.S.C. §102(b) AND 35 U.S.C. §103(a)

Claims 1-8 and 11-17, were rejected under 35 U.S.C. §102(b) as being anticipated by Schiel (5,226,357). Claims 9-10 were rejected under 35 U.S.C. §103(a) as being obvious over Schiel in view of Koivukunnas et al. (5,438,920). The Examiner's rejections are respectfully traversed.

U.S. Patent 5,226,357 discloses a multi-roll calender, in which a sag-compensation roll is used as the bottom roll of the calender only (column 5, lines 5-7). The sag-compensation roll is of the type in which a sag thereof is compensated by an internal pressure, i.e there is a pressurized chamber in the roll. The specification of the patent states only in a very general way that the sag of the intermediate rolls is calculated through the roll weights, linear loads and the inherent stiffness of the rolls. Further it is noted that the computer system used in the calculation is described in principle only ("A complex system of equations that reside in the present invention in a control computer ..."; column 2, lines 32-52).

U.S. Patent No. 5,438,920 discloses a method and apparatus, in which a web to be calendered is passed through nips formed by a variable-crown upper roll, a variable-crown lower roll, and by at least two intermediate rolls arranged between the upper and lower rolls. Such rolls are used as the intermediate rolls in which the form of the natural deflection line produced by their own gravity is substantially equal. The nip load produced by the masses of the intermediate rolls and the auxiliary equipment related to the same is relieved substantially completely, and an adjustable load is applied to the nips by means of the variable-crown upper or lower roll.

It is submitted that the method and arrangement according to the present invention differs from those disclosed in U.S. Patent 5,226,357 in the following manner:

- the deflection properties of the intermediate rolls may differ from each other;
- both the upper and lower rolls are variable-crown rolls and are controllable by zones;
- the relief pressures of the intermediate rolls are calculated according to the grade of paper,
- a very accurate and detailed calculation is used in calculating the relief pressures, so that in said calculation at least the following features accounted for: the effect of the external masses; the stiffness, masses and form of the rolls; the base constants and material properties of the polymer rolls; the effect of the temperature on the elastic modulus; the symmetry of the service side and driving side of the machine,
- the calculation of the relief pressures by means mathematical programming and optimizing; and minimizing the deflection of the intermediate rolls by optimizing the relief pressures;
- updating the data base carrying out the calculation with each change or variation in the rolls.

CONCLUSION

It is respectfully submitted, that in view of the amendments made to the claims and in view of the arguments presented above, that the Examiners's rejection of the claims have been overcome and should be withdrawn.

A petition for a three-month extension of time is submitted herewith along with a petition fee. If it is determined that any additional fee is required for the entry of this amendment, the U.S. Patent and Trademark Office is specifically authorized to charge such fee to Deposit Account No. 50-0518 in the name of Steinberg & Raskin, P.C.

According to currently recommended Patent Office policy, the Examiner is specifically authorized to contact the undersigned in the event that a telephonic interview would advance the prosecution of this application.

An early and favorable action on the merits is earnestly solicited.

Respectfully submitted,

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Encls.

- Petition for three-month extension;
- Check for petition fee.